

CLAIMS

1. An apparatus for producing crystals wherein a seed crystal is placed in the crucible retained in a furnace,
5 raw materials filled in the crucible are heated and liquefied, and a crystal grown by slow cooling of raw materials in the crucible from below upward, said apparatus characterized by comprising:
a temperature controlling means for cooling or
10 heating in the vicinity of the seed crystal locally.
2. The apparatus for producing the crystals according to Claim 1, wherein the temperature controlling means comprises a hollow constructed cap mounted outside the
15 crucible where the seed crystal is placed, and means for regulating refrigerant flow running through the hollow portion.
3. The apparatus for producing the crystals according
20 to Claim 2, wherein:
the cap is divided in multiple caps; and
the temperature controlling means comprises means for regulating independently refrigerant flow running through each hollow portion of the multiple caps.
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4. The apparatus for producing the crystals according to Claim 2 or Claim 3, wherein the cross section of the

cap varies in size along path direction of the refrigerant flow.

5. The apparatus for producing the crystals according to Claim 2, Claim 3, or Claim 4, wherein the cap includes a heater and the temperature controlling means comprises means for performing conducting control to a heater with the refrigerant flow regulation.

10 6. The apparatus for producing the crystals according to any one of Claims 2 to 5, wherein the material of the cap consists of one of a metal having conductive property, heat-resistant and corrosion-resistant of Pt or the equivalent, and an oxide having conductive property,
15 heat-resistant and corrosion-resistant.

7. The apparatus for producing the crystals according to Claim 1 wherein the temperature controlling means comprises a helical pipe mounted outside the crucible
20 where the seed crystal is placed, and means for regulating refrigerant flow running through the pipe.

8. The apparatus for producing the crystals according to Claim 7 wherein the temperature controlling means
25 regulates the refrigerant flow by introducing refrigerant running through the pipe from lower portion of the seed crystal and discharging to the upper portion

thereof.

9. The apparatus for producing the crystals according to Claim 7 or Claim 8 wherein:

5 the pipe is divided in multiple pipes; and
 the temperature controlling means comprises a means for regulating independently refrigerant flow regulation running through each of the multiple pipes.

10 10. The apparatus for producing the crystals according to Claim 7, Claim 8 or Claim 9, wherein the cross section of the pipe varies in size along path direction of the refrigerant flow.

15 11. The apparatus for producing the crystals according to any one of Claims 7 to 10, wherein the pipe includes a heater and the temperature controlling means comprises means for performing conducting control to a heater with the refrigerant flow regulation.

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12. The apparatus for producing the crystals according to any one of Claims 7 to 11, wherein the material of the pipe consist of one of a metal having conductive property, heat-resistant and corrosion-resistant of Pt
25 or the equivalent, and an oxide having conductive property, heat-resistant and corrosion-resistant.

13. The apparatus for producing the crystals according to any one of Claims 1 to 12, wherein the major components are composed of oxide or carbonate of Ia and Vb groups in a periodic table, the Ia group being lithium and potassium, and the Vb group being at least one of niobium and tantalum.

14. The apparatus for producing the crystals according to any one of Claims 1 to 12, wherein the major components are composed of oxide or carbonate of Ia and Va groups in a periodic table, the Ia group being lithium and potassium, the Vb group being at least one of niobium and tantalum, and at least one of oxide or carbonate of IIa group in a periodic table as added impurities.